Pamphlet No. 35

TANGANYIKA TERRITORY

DEPARTMENT OF AGRICULTURE

Ninth Annual Report of the Coffee Research and Experiment Station, Lyamungu, Moshi 1942

IMPERIAL MYCOLOGICAL
15 SEPT 1943
INSTITUTE

1943
DAR ES SALAAM
PRINTED BY THE GOVERNMENT PRINTER
Price Sh. 1/50 (1s. 6d.)

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COFFEE RESEARCH AND EXPERIMENT STATION, LYAMUNGU, MOSHI

Report for the period 1st January to 31st December 1942

ADMINISTRATION

Staff List in January 1942

Chief Scientific Officer in general charge.—S. M. Gilbert, B.Sc. (Agric.), N.D.A., Dip. Agric. (Wye).

Plant Pathologist.—G. B. Wallace, B.Sc. (Agric.), Ph.D. (Edin.).

Staff Changes

The majority of the pre-war members of the staff are still on war service. The post of Agricultural Officer was occupied by Mr. H. Marsland, B.Sc., N.D.A., N.D.D., from the 9th February to the 9th March, and that of Agricultural Assistant by Mr. D. Shepstone from the 7th March to the 19th September. On the 22nd August Mr. L. M. Fernie was released from war service and resumed his post as Agricultural Assistant on the station. Mrs. L. M. Fernie, B.Sc. (Hort.), was appointed for vegetable seed production on the 1st September. On the 26th December Mr. S. M. Gilbert, Chief Scientific Officer, was seconded to Dar es Salaam as Controller (Distribution and Disposal of Controlled Produce).

Visitors

His Excellency the Governor and party visited the station on the 13th June.

Contacts with Growers

The Chief Scientific Officer visited the Southern Highlands in February. Visits to coffee plantations in the Tanga and Northern provinces were made by the staff when opportunity offered. Several parties of Africans were shown over the station.

Finance

Details of expenditure for the year are given in Appendix I.

Revenue amounted to £739 6s., plus £12—the value of beans used in labourers' rations.

Station Development

Experiment IIIA was planted. This is a modification of Experiment III, and its object is to compare seedling coffee with clones of the same trees. Sixteen acres have been prepared for clonal selection trials, the first planting

of which will be commenced in 1943. At the end of the year station land was occupied as follows :—

	Acres	Change
Coffee :—		
(a) under three years	16	—15
(b) over three years	61	+15
Nurseries...	2	
Bananas and fodder grasses	45	+ 9
Paddocks	30	
Coppices and wind belts	27	
In preparation for experiments	16	+11
Forest	30	
Roads, buildings, etc.	27	
Bush—uncleared	48	—20
Food gardens for labourers	8	
Total ...	310	

Ten tons of parchment coffee were produced.

Meteorology

The total rainfall was 87·52 inches (2,223·2 millimetres). The average rainfall for nine years is 70·9 inches (45·6 to 100·7 inches). The heavy rains extended over a long period and were followed by dull humid weather. The short rains were below normal. On the 5th/6th April 10 inches of rain fell in five hours, a record for this station.

Vegetative Propagation

A concentrated effort has been made to obtain rooted cuttings of selected trees, and over seven thousand have been successfully rooted during the year. These are required for planting up Clonal Selection Trials.

Selection Work

Field records of mother trees on two estates were completed, but laboratory studies have still to be made. The records of mother trees on other estates have been discontinued.

Pests and Diseases

On the station coffee Antestia and Leaf miner were remarkably scarce this year. Hemileia started early. Hemileia spray experiments on two native holdings were abandoned : no difference in yields were obtained after several years of treatments. This is believed to be a result of the presence of other factors adversely affecting cropping capacity. The spray experiment on the particular form of yellowing of coffee at Ngare Ol Motoni had to be discontinued owing to labour not being available. Pathological notes on other crops are reported upon separately.

Vegetable Seed Production and Medicinal Plants

Separate reports have been submitted by Mrs. L. M. Fernie describing the early stages of this work. Small-scale trials were made this season; the experience gained and the information to date promise useful results from cultivation on a larger scale in 1943.

Co-operative Experiments

Owing to difficulties in obtaining the correct fertilizers and to changes in management involving delays in the application of treatments, it is not proposed to publish the results from the Arusha experiments. On Estate E (Kilimanjaro) thatching grass again proved beneficial. Sulphate of ammonia was also an economic proposition,—see table.

Estate E.—Summary of Results—1942

(a) MAIN PLOTS

Mean Yield	Nil	Pen Manure	Thatching grass	Guinea grass	Mean	Standard error
Clean cwt. per acre ...	6·92	5·83	7·48	7·19	6·86	0·30
Percentage	100·9	84·9	109·0	104·8	100·0	4·37

(b) SUB-PLOTS

Mean yield	Nil *		Pen manure		Thatching grass		Guinea grass		Mean	Standard error	Sig. diff.
	S.A.	Nil	S.A.	Nil	S.A.	Nil	S.A.	Nil			
Clean cwt. per acre ...	7·31	6·53	6·26	5.40	8·03	6·94	8·06	6·33	6·86	0·31	0·63
Parcentage ...	106·6	95·2	91·3	78·7	117·0	101·2	117·4	92·3	100·0	4·52	9·18

EXPERIMENTS ON STATION

Experiment I.—Method of Planting—Planted 1935

(a) MAIN PLOTS

	Mean yield–1942		Mean of 5 years	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
No holing	5·04	113·3	6·68	102·3
†H3F1	4·98	111·9	7·24	110·9
‡HF1	3·89	87·9	5·97	91·4
Hole sub-soiled:				
Without compost, H3F1 ...	3·81	85·6	6·82	104·4
,, ,, HF1 ...	3·70	83·1	6·08	93·1
Hole not sub-soiled:				
With compost, H3F1	4·85	109·0	6·91	105·8
,, ,, HF1	4·88	109·7	6·08	93·1
Mean	4·45	100·0	6·53	100·0
Standard error	0·19	4·3	0·16	2·5
Signficant difference, P = ·2 ...	0·42	9·44	0·30	4·7

(b) SUB-PLOTS

	Mean yield–1942		Mean of 5 years	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Planting:				
Deep with ball of earth ...	3·76	84·5	5·99	91·7
Deep bare roots	3·87	87·0	5·80	88·8
At nursery level—				
With ball of earth	5·80	130·3	7·29	111·7
Bare roots	4·36	98·0	7·03	107·7
Mean	4·45	100·0	6·53	100·0
Standard error	0·32	7·2	0·12	1·8
Significant difference	0·62§	14·4	0·57‖	8·4

The benefit from opening up holes well in advance of planting, refilling in good time to allow the soil to settle, and planting at nursery level is maintained over the five-year period. No advantage is shown from sub-soiling or compost.

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* ½ lb. Sulphate of ammonia per tree.

†H3F1=Holed three months and filled one month before planting. ‡HF1=Holed and refilled one month before planting.

§P = ·05 ‖P = ·001

Experiment II.—Seedling Selection Trials

L.S.'s I, II, III planted 1938. L.S. IV and R.B.'s I and II planted 1939

LATIN SQUARE I

Selection	P147	P190	P280	P313	P348	F502	Mean	Standard error	Sig. dif.
									P = ·001
Clean cwt. per acre	1·57	1·29	4·35	4·60	2·07	2·65	2·76	·29	1·55
Percentage	56·9	46·7	157·6	166·7	75·0	96·0	100·0	10·5	56·1

LATIN SQUARE II

Selection	E59	N39	P147	H133	F839	L1		
Clean cwt. per acre	·69	·93	·76	1·56	1·11	1·13	1·03	0·27
Percentage	67·0	90·3	73·8	151·5	107·8	109·7	100·0	26·2

LATIN SQUARE III

Selection	E665	P313	N30	H1	N69	F840			
Clean cwt. per acre	1·40	3·13	1·54	1·34	1·83	·90	1·91	0·26	1·39
Percentage	73·3	163·9	80·6	70·2	95·8	47·1	100·0	13·6	72·8

LATIN SQUARE IV

Selection	N197	R3	H1	L1	N39	N81			
Clean cwt. per acre	0·55	0·98	0·81	0·75	0·05	0·94	0·68	0·08	·44
Percentage	80·9	144·1	119·1	110·3	7·4	138·2	100·0	11·8	64·7

RANDOMIZED BLOCK I

Selection	R11	R2	H133	H61	N5	J104	Con.	R13	N106	Mean	Stand. error	Sig. dif.
												P = ·2
Clean cwt. per acre	0·83	0·65	0·91	0·72	0·46	0·80	0·87	0·82	0·55	0·74	0·12	0·21
Percentage	112·2	87·8	123·0	97·3	62·2	108·1	117·6	110·8	74·3	100·0	16·2	28·4

RANDOMIZED BLOCK II

Selection	N100	N217	R1	N229	N34	E325	N182	N215	J49			
												P = ·01
Clean cwt. per acre	1·27	1·58	1·13	0·89	1·24	0·52	0·83	1·03	1·37	1·10	0·17	0·53
Percentage	115·5	143·6	102·7	80·9	112·7	47·3	75·5	93·6	124·5	100·0	15·5	48·2

The figures from this first year's crop show a wide difference in yield between the selections in each square or block. This may be partly a result of the patches of *sangare* grass which had previously occurred on the field. Figures for several years' yields will be necessary for reliable comparisons.

Experiment III.—Clonal and Seedling Trees

Planted 1937

Growth of the multiple stems has been satisfactory, and grafting of these will be done in 1943.

Experiment IIIA.—Clonal and Seedling Trees

Planted 1942

The young plants are making headway, but have had to be watered in dry periods.

Experiment VI.—Seedling Stocks

Square 5 was planted with the five best clonal selections.

Experiment V.—Mulch, Compost and Nitrogen

Planted 1940

Growth and flowering have been satisfactory, and the first crop will be taken in 1943.

Experiment VIIA.—Conversion to Multiple Stem—Converted 1940

	Mean yield 1942		Mean of 3 years 1940-42	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Clean stump, 3 suckers	10·4	78·8	7·1	85·5
Cut off west side primaries, 3 suckers from bottom...	16·0	121·2	9·0	108·4
Cut off east side primaries, 3 suckers from bottom...	14·9	112·9	9·2	110·8
Cut off all except top 3 primaries, 3 suckers from bottom	13·6	103·0	9·3	112·0
Agobiada, multiple stem, 3 suckers ...	10·0	75·8	7·5	90·4
Top cut at 3 feet from ground and 3 suckers left to grow at top ...	14·8	112·1	8·3	100·0
Mean	13·2	100·0	8·3	100·0
Standard error	0·58	4·39	0·3	3·6
Significant difference, P=·001	2·68	20·30	1·3	15·7

It is of interest that the order of the treatments as regards yield is the same for the three-year period as it was for the year of conversion to multiple stem (see 1940 or 1941 report), but with smaller differences. The plots converted to multiple stem by the second, third and fourth treatments in the above table yielded significantly better than the first or fifth.

Experiment IX.—Methods of Cultivation—Planted 1934

	Mean yield 1942		Mean of 5 years 1938-42	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Treatment:				
Forked hoe (forked jembe) ...	1·86	100·5	2·93	98·3
West Indian hoe (Jembe)	2·43	132·1	3·46	116·1
Nil	1·90	103·3	3·01	101·0
Envelope forked	1·63	88·6	2·76	92·6
Trenched	1·38	75·0	2·76	92·6
Mean	1·84	100·0	2·98	100·0
Standard error...	0·10	5·4	0·34	11·4
Significant difference*	—	—	—	—

Experiment X.—Artificial Shade—Planted 1937

This experiment will be resumed when webbing again becomes available. Crop figures are being recorded as they may indicate after-effects from the treatments previously given.

Experiment XI.—Kents versus *Bourbon—Planted 1935*

SUMMARY OF RESULTS—1938 TO 1942

	Clean cwt. per acre	
	Kents	Bourbon
1938	7·69	7·12
1939	4·86	3·11
1940	3·70	5·10
1941	12·87	9·51
1942	5·72	9·34
Mean	6·97	6·84

*The results are not significant.

Experiment XII.—Selection in Nursery—Planted 1935

	Mean yield 1942		Mean of 5 years 1938-42	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Tops cut back	3·46	119·3	3·51	91·6
Good roots and good tops	2·96	102·7	4·51	117·8
Average	2·94	101·4	3·88	101·3
Good tops and poor roots	3·22	111·3	4·19	109·4
Poor tops and good roots	2·46	84·8	3·51	91·6
Poor tops and poor roots	2·39	82·4	3·41	89·0
Mean	2·90	100·0	3·83	100·0
Standard error	0·55	18·97	0·31	8·1
Significant difference P = ·2	*	—	0·58	15·1

Over a period of five years the selection of the best seedlings has resulted in the highest yield.

Experiment XIII.—Type of Growth—Planted 1936

The following table shows that, as in 1941, the multiple stem coffee has heavily outyielded single stem and agobiada, but no real deduction can be drawn until another year's growth completes the cycle :—

	Mean yield 1942		Mean of 4 years 1939-42	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Single stem	6·04	61·2	4·69	69·3
Multiple stem, 3 suckers ...	13·82	140·0	10·06	148·6
Multiple stem, 3 suckers agobiada	9·76	98·9	5·56	82·1
Mean	9·87	100·0	6·77	100·0
Standard error	0·88	8·9	0·48	7·1
Significant difference	3·05†	30·9	4·05‡	59·8

Experiment XIV.—Mulch Experiment—Planted 1935

	Mean yield 1942		Mean of 5 years 1938-42	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Banana mulch (100 lb. per tree)	12·4	97·6	7·6	122·6
Guinea grass mulch (100 lb.) ...	14·0	110·2	7·2	116·1
§Banana mulch (50 lb.) plus S. of A. (½ lb.)	9·4	74·0	5·7	92·3
§Elephant grass mulch (100 lb.)	9·1	71·7	5·2	83·9
Clean weeded	15·0	118·0	6·0	96·8
Weeds as mulch	11·6	91·3	5·3	85·5
§Elephant grass mulch (50 lb.) plus S. of A. (½ lb.)	13·2	103·7	5·9	95·2
Compost (50 lb.) per tree ...	16·6	130·0	6·7	108·6
Mean	12·7	100·0	6·2	100·0
Standard error	1·2	9·4	0·29	4·68
Significant difference	3·3‖	26·0	1·45¶	23·38

While results from individual treatments vary greatly from year to year, banana trash and guinea grass maintain their superiority.

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*Does not pass Z test.

†P = ·05 ‡P = ·001

§Note that these plots had two years of very harmful cover crop treatments.

‖P = ·05 ¶P = ·001

Experiment XIVA.—Mulch Experiment—Planted 1940

(a) PLOT TOTAL YIELDS IN KILOS—1942

Treatment:	Without Nitrogen	With Nitrogen 2 oz. per tree	Main Plots
Nil	49·0	53·0	102·0
Banana mulch (80 lb. per tree)	68·0	55·0	123·0
Elephant grass (80 lb. per tree)	53·0	51·0	104·0
Guinea grass (80 lb. per tree)	65·0	56·0	121·0
Compost (50 lb. per tree)	38·0	36·0	74·0
Mean	54·6	50·2	104·8
Standard error	0·253	0·253	3·05
Signficant difference*	–	–	–

(b) MEANS OF TWO DIAMETERS IN MILLIMETRES

Treatment:			
Nil	25·9	21·4	23·7
Banana mulch (80 lb. per tree)	26·6	23·3	24·9
Elephant grass (80 lb. per tree)	25·8	22·3	24·1
Guinea grass (80 lb. per tree)	27·5	22·2	24·8
Compost (50 lb. per tree)	24·0	20·6	22·3
Mean	25·9	21·9	23·9
Standard error	1·34	1·34	2·37
Significant difference	3·95†	3·95†	4·55‡

Reliable results cannot be obtained from this first year's figures, but banana mulch and guinea grass, with and without nitrogen, have given the highest yields.

Stock

The following are notes made by the Chief Scientific Officer. The health of all stock has been good. Milk records have been maintained and the yields of the majority have been satisfactory. The best heifer yielded over two thousand five hundred pounds of milk in her first lactation and was dried off at three hundred days when giving seven pounds of milk. Sixteen calves were born, sired by the Baraton bull, of which six were heifers. The bull made satisfactory development. The herd is now self supporting and, in addition, gave sufficient manure to "inoculate" grass providing over four hundred tons of compost.

At the end of the year the stock consisted of :—

Kind	Number
Stud bull	1
Cows and in-calf heifers	19
Heifers due to breed	3
Heifer calves	9
Young bulls	10
Bull calves	7
Donkeys	2
Total	51

Fodder Grasses

The areas under bananas, fodder grasses and paddocks have been maintained.

*The results are not significant.
†P = ·05 ‡P = ·2

Elephant Grass.—Time of Cutting—Planted 1938

Cutting interval in weeks	Yield–1942 Yield tons per acre	Yield–1942 Percentage	Mean yield of 3 years 1940–1942 Yield tons per acre	Mean yield of 3 years 1940–1942 Percentage
10	18·6	69·4	40·84	93·7
12	15·9	59·3	34·40	78·7
14	25·8	96·3	43·20	99·2
16	34·6	129·1	49·80	114·3
18	26·2	97·8	41·00	94·1
20	40·5	151·1	52·06	121·9
Mean	26·8	100·0	43·57	100·0
Standard error	0·464	17·3	0·42	0·94
Significant difference	2·52*	9·4	2·12†	4·90

*P = ·001 †P = ·01

Lyamungu, Moshi,
27th March 1943

S. M. GILBERT,
Chief Scientific Officer

STATEMENT OF EXPENDITURE FOR THE PERIOD 1ST JANUARY TO 31ST DECEMBER 1942

I.—Personal Emoluments

Item No.		Provision Shs. Cts.	Expenditure Shs. Cts.
3	Chief Scientific Officer		24,000·00
12	Agricultural Assistant		2,680·00
19	Asiatic Clerk...		3,927·22
21	Recorders		6,231·21
22	Mechanic		2,598·39
23	African Mechanics	43,141·50	710·00
26	African Laboratory Assistants		745·00
27	Overseers, Agricultural Stations		635·00
28	Motor Driver...		595·00
29	Messengers		358·00
		43,141·50	42,479·82

II.—Other Charges

31	Travelling Allowances	600·00	...	248·00
32	Transport Allowances	2,250·00	...	1,832·05
33	Transport	1,000·00	...	800·75
34	Railway Fares and Freight:			
	(a) Departmental	900·00	...	780·20
	(b) Local Leave	200·00	...	446·00
35	Maintenance and Running of Motor Vehicles ...	3,000·00	...	1,817·18
37	Books of Reference	600·00	...	98·42
38	Contingencies	300·00	...	119·98
40	Stationery	500·00	...	252·52
51	Plant Sanitation	300·00	...	289·42
54	Upkeep of Agricultural Stations	1,000·00	...	491·96
56	Upkeep of Coffee Research Station:			
	(a) Labour			16,990·99
	(b) Field Experiment off Station			1,003·84
	(c) Maintenance of Power, Gas, Water, etc. ...			1,797·88
	(d) Upkeep of Coffee Factory	28,400·00	...	999·52
	(e) Upkeep of Stock			997·75
	(f) Equipment and Materials			2,082·21
	(g) Trials of Clonal Coffee...			2,996·10
		39,050·00		34,044·77
	Outstanding accounts on Crown Agents Indents		...	700·00
		39,050·00		34,744·77

Increased Food Production Campaign

	Personal Emoluments	2,000·00	...	1,600·00
5	Production of Vegetable Seed:			
	(a) Capital	1,600·00	...	830·18
	(b) Recurrent			492·34
		3,600·00		2,922·52

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